Acceleration of urban sprawl in Montreal during the last 60 years and the need for a change

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Consequences of Sprawl

ENVIRNOMENTAL IMPACTS	
Energy	• Less land available for renewable energy supplies and industrial purposes • Higher energy consumption (e.g. due to dispersed character of sprawled areas)
Food	• Less land available for food production • Reduced quality of agricultural products (e.g. due to soil contamination or over fertilization)
Land	• Land consumption and soil sealing • Landscape fragmentation • Loss of agricultural lands due to conversion into higher built-up areas
Climate	• Modification of temperature conditions (e.g. heat island effect, heating up of roads) • Modification of wind conditions (e.g. due to aisles in forests in fragmented areas)
Flora and fauna	• Loss of valuable ecosystems for different kinds of animals • Death of animals caused by road mortality • Change in animal movement behavior due to changes in the land use
Water	• Negative impact on hydrological systems (e.g pollution by oil and fuel) • Loss of permeability of soil for water
Pollutions	• Higher noise pollution (e.g. the noise produced by vehicles and rapid growth in transport volumes) • Urban air pollution (e.g. air pollution due to higher dependency on cars and higher use of fuel and oil)
Landscape scenery	• Change in look of landscape (e.g. penetration of the landscape by posts and wires) • Change of landscape character due to its less recreational character in sprawled areas
ECONOMICAL IMPACTS	
Costs	•Higher public service costs (e.g. higher public transport costs) • Increase in personal transportation costs due to long commutes
SOCIAL IMPACTS	
Human being	• Negative health effects, such as obesity • Increase in traffic and traffic-related fatalities • Higher mental health problems (e.g. higher level of stress) • Lack of physical activity (e.g. due to higher automobile dependency)

Lack of agreement on how to:

Define

Measure

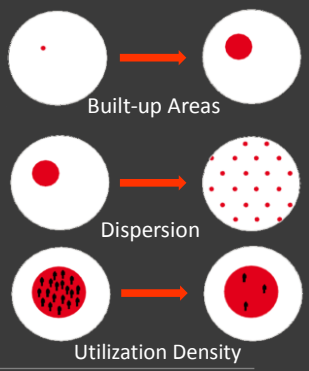
Control

Definition of Urban Sprawl

"Urban sprawl denotes the extent of the area that is built up and its dispersion in the landscape in relation to the utilization of built-up land for living and work"

Schwick et al. 2012

Definition of Urban Sprawl



Schwick et al. 2012

The Questions?

1. What is the current degree of urban sprawl in Montreal?

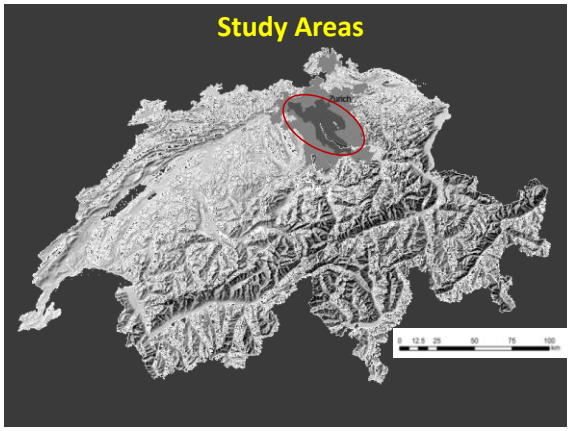
2. What are the historical trends of sprawl in Montreal?

3. Where are the highest levels of sprawl, and when did the strongest increases of sprawl occur in Montreal?

4. What are the similarities and differences between Montreal, and Zurich regarding urban sprawl?

Study Areas

Study Areas



Method

Newly proposed method of urban permeation and weighted urban proliferation (Jaeger and Schwick 2014)

Data

CanVec and CanMap vector data (2011)

National topographic maps at the scale of 1/50000 (1951, 1971, 1986 and 1996)

Census of population and work place

Urban Sprawl Metrics

Urban Permeation

$$UP = \frac{\text{Settlement area}}{\text{Area of reporting unit}} \cdot DIS$$

Dispersion of built-up areas

DIS

Utilization Density

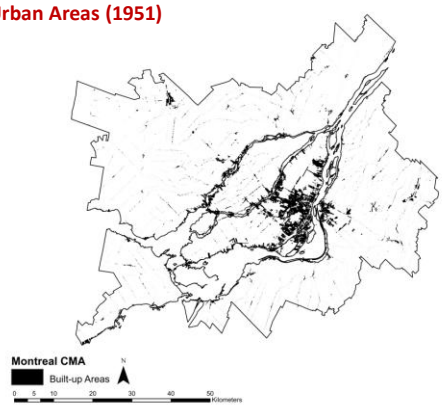
$$\frac{N_{INH+JOBs}}{\text{Settlement area}}$$

Weighted Urban Proliferation

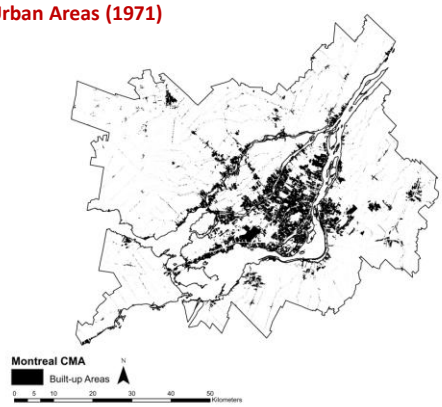
$$WUP = UP \cdot w_1(DIS) \cdot w_2(UD)$$

Schwick et al. 2012

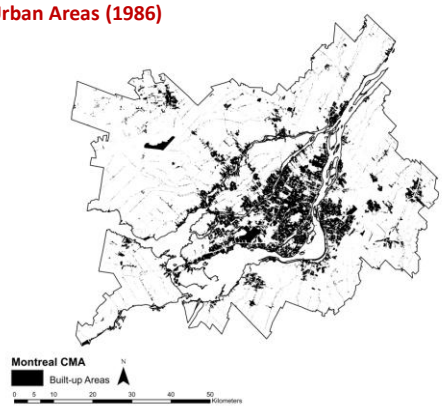
Urban Areas (1951)



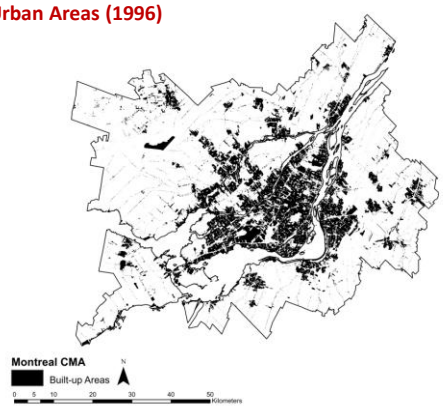
Urban Areas (1971)



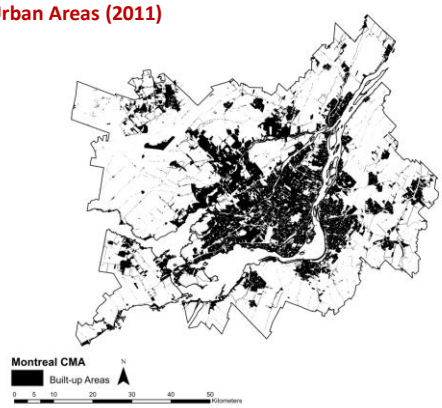
Urban Areas (1986)



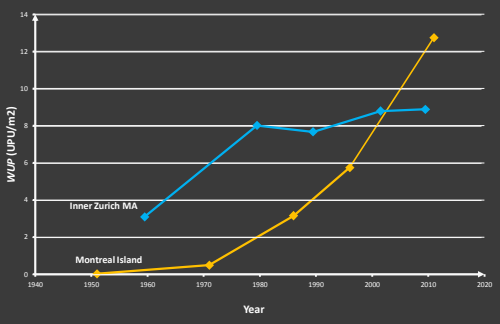
Urban Areas (1996)



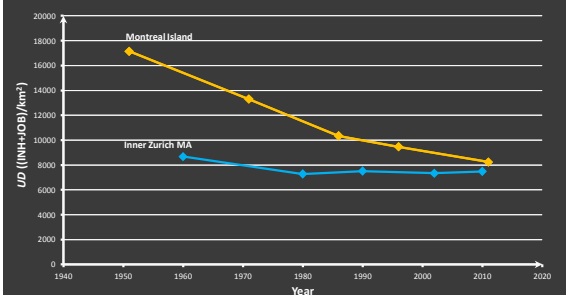
Urban Areas (2011)



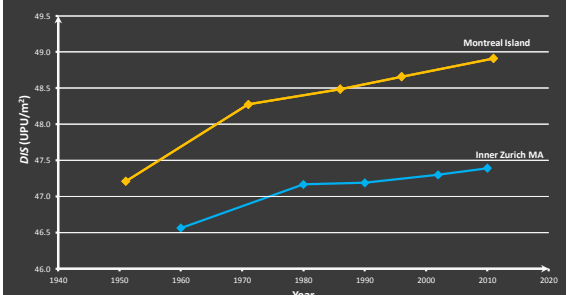
Urban Sprawl

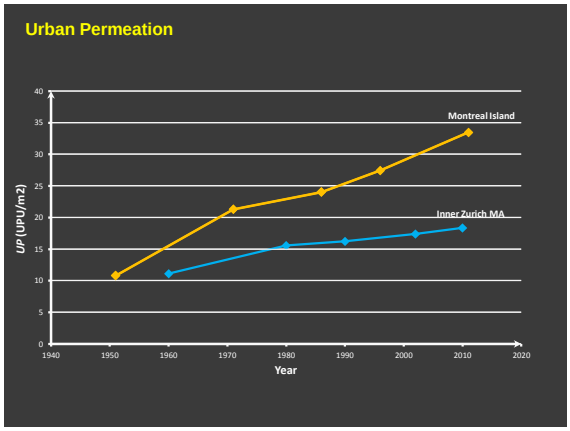


Utilization Density

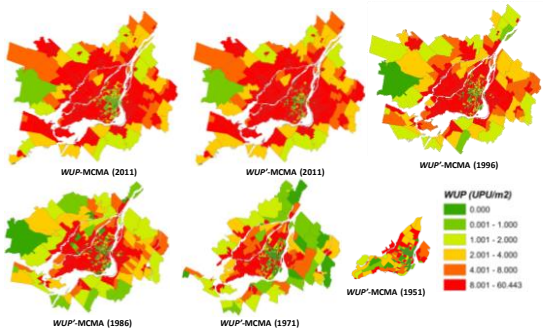


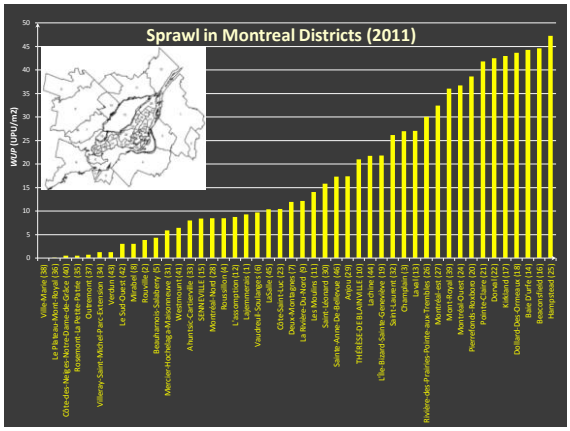
Dispersion





Montreal Census Metropolitan Area





Conclusions

Urban sprawl has been rapidly increasing in Montreal!

Most strongly in the last 25 years!

From 1971 to 2011, urban sprawl in Montreal Island increased by **25 fold**!

Why?

Drastic increase in the amount of built-up areas

High dispersion of built-up areas

Low utilization density within the built-up areas

In Zurich:

The highest increases of urban sprawl happened before 1980

Why is urban sprawl in Zurich lower?

Higher density of built-up areas

Densification of existing built-up areas

The strong regional planning legislation in Switzerland

Extensive expansion of public transport

Reduction of car transportation

Polycentric settlement structure

What to do?

Immediate action is required to stop urban sprawl!

How?

Establishing quantitative limits to curtail urban sprawl

Establishing a set of suitable indicators for controlling urban sprawl in future

"Reduction of land uptake per inhabitant and concentration of existing settlement areas without extending the borders of each settlement" (Schwick et al. 2012)

What else?

- Concentration of existing settlement areas
- Prohibiting new built-up areas and individual buildings in open countryside
- Limiting the sizeof designated building zones
- Setting limits and benchmarks for sprawl
- Identifying the lands that should be preserved from urban sprawl (e.g. high quality soils)

Controlling the dispersion

- Urban residential intensification (URI)
- Increasing the walkability

New policies

- Increasing the taxation for urban developments in areas that are more in danger from urban sprawl
- Educating the public

THANK YOU!